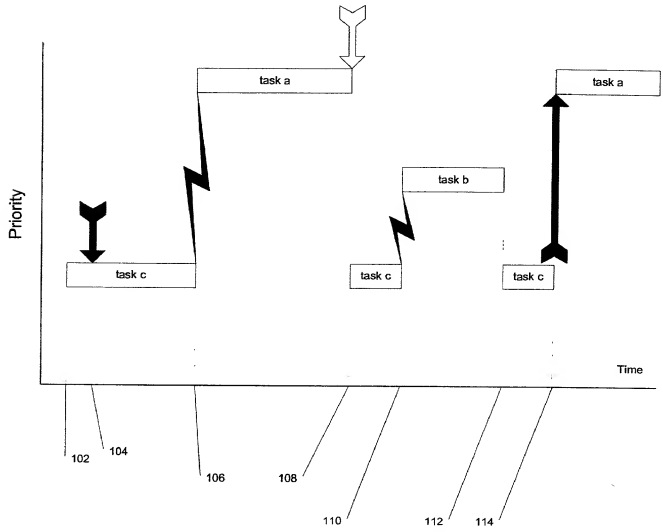
09812752 "052001



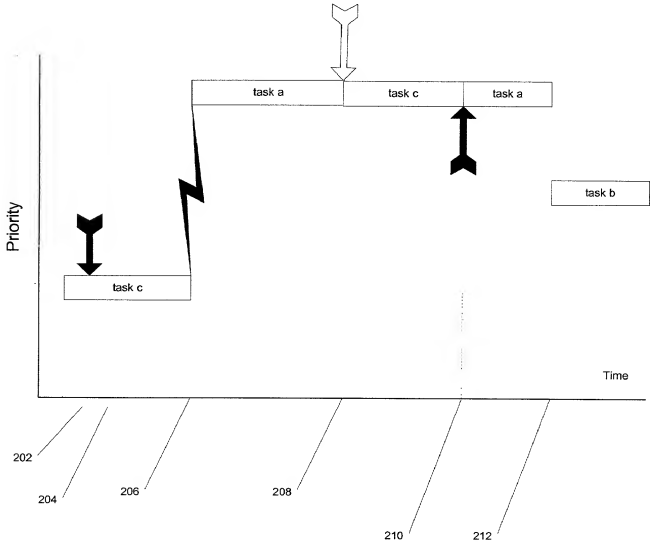
Legend:

Task Receives Resource

Task Requests Resource That Is Unavailable

Higher Priority Task Preempts Lower Priority Task

Figure 1



Legend:

Task Receives Resource

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Higher Priority Task Preempts Lower Priority Task

Figure 2

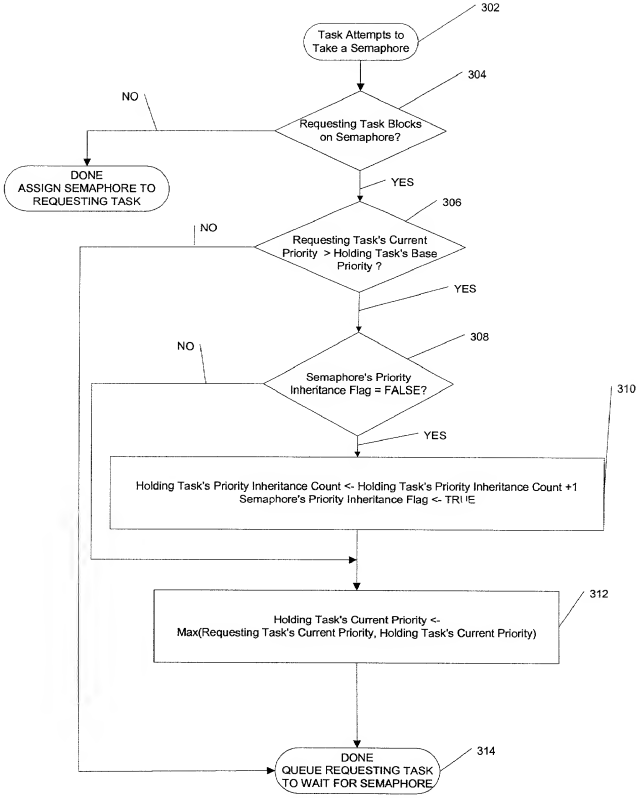
302
Task Attempts to Take a Semaphore
304
NO
Requesting Task Blocks on Semaphore?
DONE
ASSIGN SEMAPHORE TO REQUESTING TASK
YES
306
NO
Requesting Task's Current Priority > Holding Task's Base Priority ?
YES
308
NO
Semaphore's Priority Inheritance Flag = FALSE?
310
YES
Holding Task's Priority Inheritance Count <- Holding Task's Priority Inheritance Count +1
Semaphore's Priority Inheritance Flag <- TRUE
312
Holding Task's Current Priority <-
Max(Requesting Task's Current Priority, Holding Task's Current Priority)
DONE
QUEUE REQUESTING TASK TO WAIT FOR SEMAPHORE
314

Figure 3

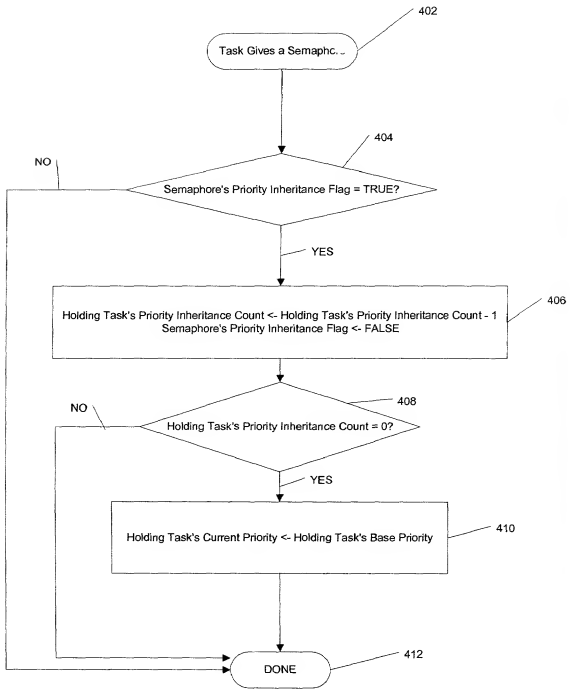
402
Task Gives a Semaphc..
404
NO
Semaphore's Priority Inheritance Flag = TRUE?
YES
Holding Task's Priority Inheritance Count <- Holding Task's Priority Inheritance Count - 1
Semaphore's Priority Inheritance Flag <- FALSE
406
NO
408
Holding Task's Priority Inheritance Count = 0?
YES
Holding Task's Current Priority <- Holding Task's Base Priority
410
DONE
412

Figure 4

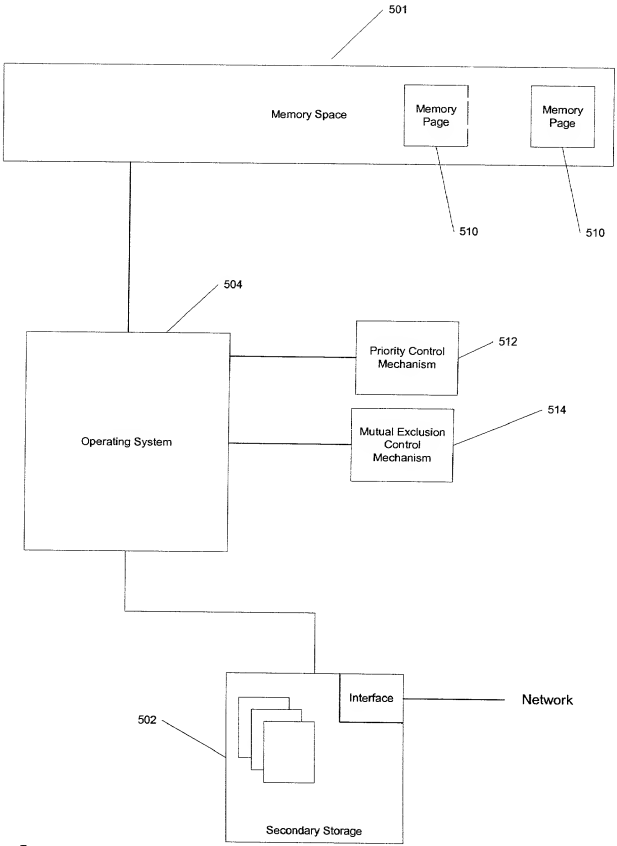
501
Memory Space
Memory Page
Memory Page
510
510
504
Priority Control Mechanism
512
Operating System
Mutual Exclusion Control Mechanism
514
Interface
Network
502
Secondary Storage

Figure 5

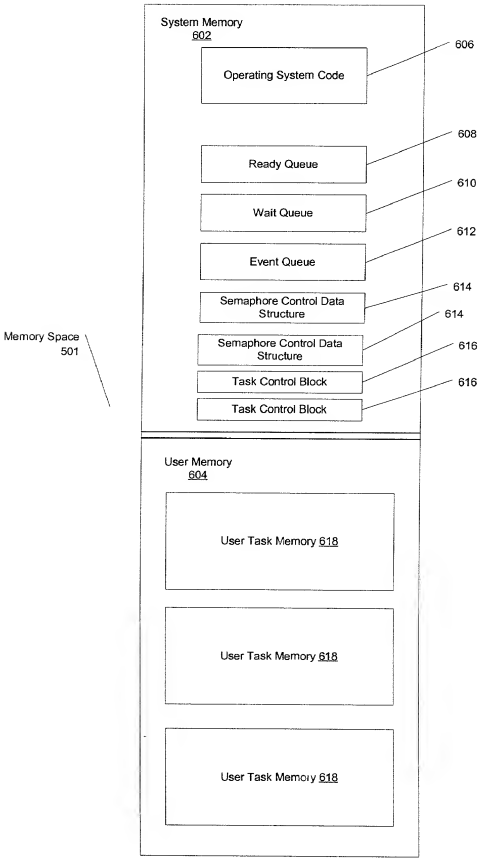
System Memory
602
Operating System Code
606
Ready Queue
608
Wait Queue
610
Event Queue
612
Semaphore Control Data Structure
614
Semaphore Control Data Structure
614
Task Control Block
616
Task Control Block
616
Memory Space
501
User Memory
604
User Task Memory 618
User Task Memory 618
User Task Memory 618

Figure 6

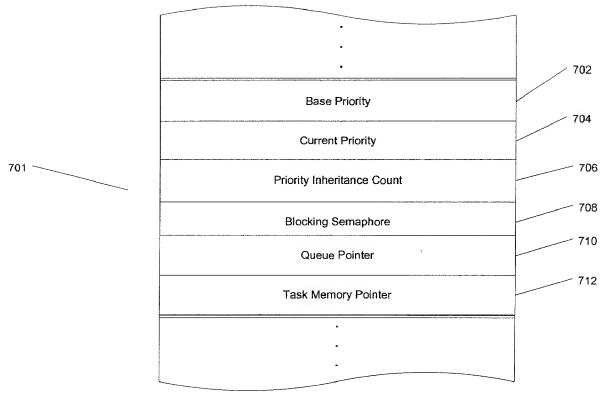
701
Base Priority
Current Priority
Priority Inheritance Count
Blocking Semaphore
Queue Pointer
Task Memory Pointer
702
704
706
708
710
712

Figure 7

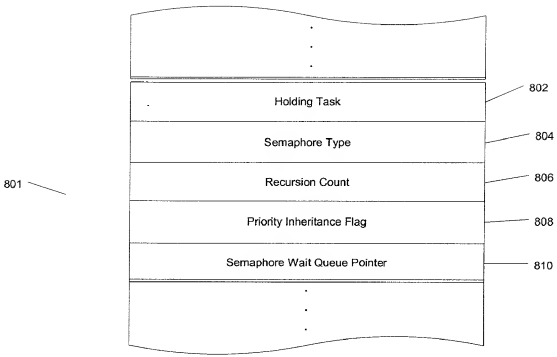
801
Holding Task
802
Semaphore Type
804
Recursion Count
806
Priority Inheritance Flag
808
Semaphore Wait Queue Pointer
810

Figure 8

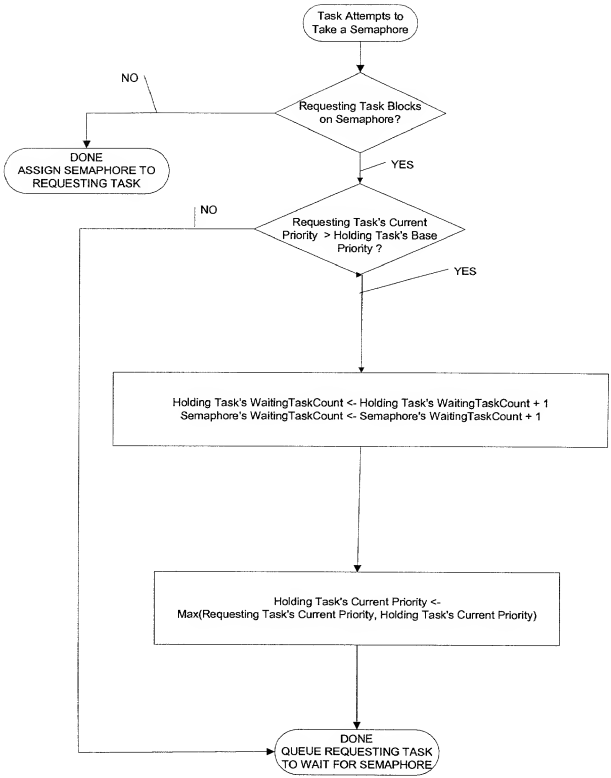
Task Attempts to Take a Semaphore
NO
Requesting Task Blocks on Semaphore?
DONE
ASSIGN SEMAPHORE TO REQUESTING TASK
YES
NO
Requesting Task's Current Priority > Holding Task's Base Priority ?
YES
Holding Task's WaitingTaskCount <- Holding Task's WaitingTaskCount + 1
Semaphore's WaitingTaskCount <- Semaphore's WaitingTaskCount + 1
Holding Task's Current Priority <-
Max(Requesting Task's Current Priority, Holding Task's Current Priority)
DONE
QUEUE REQUESTING TASK TO WAIT FOR SEMAPHORE

Figure 9

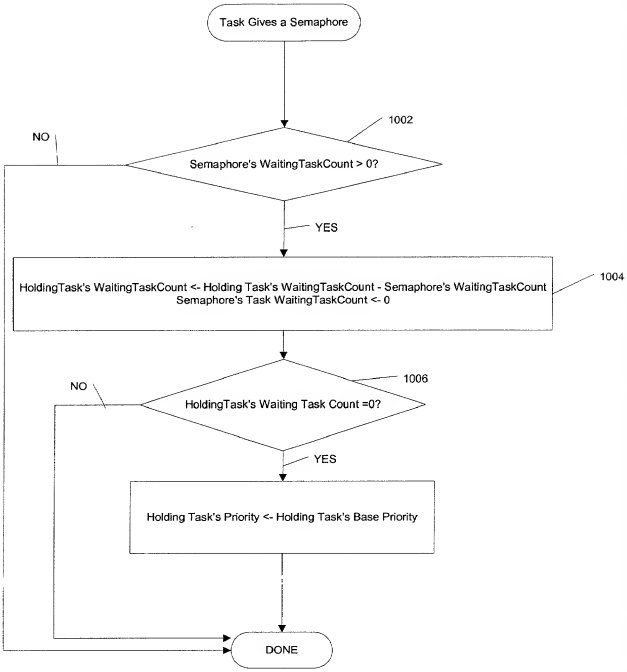
Task Gives a Semaphore
1002
NO
Semaphore's WaitingTaskCount > 0?
YES
HoldingTask's WaitingTaskCount <- Holding Task's WaitingTaskCount - Semaphore's WaitingTaskCount
Semaphore's Task WaitingTaskCount <- 0
1004
1006
NO
HoldingTask's Waiting Task Count =0?
YES
Holding Task's Priority <- Holding Task's Base Priority
DONE

Figure 10

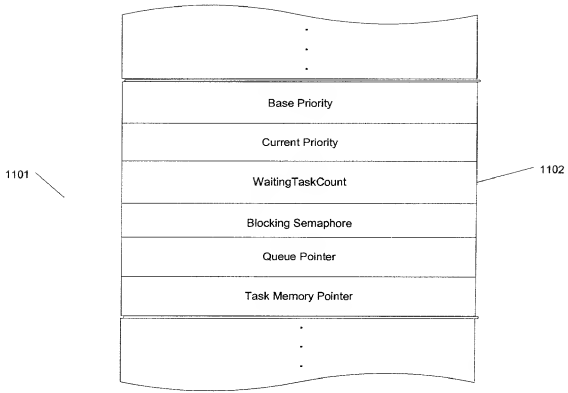
1101
1102
Base Priority
Current Priority
WaitingTaskCount
Blocking Semaphore
Queue Pointer
Task Memory Pointer

Figure 11

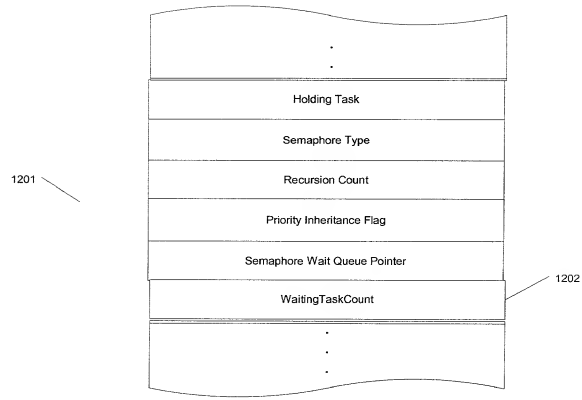
Holding Task
Semaphore Type
1201
Recursion Count
Priority Inheritance Flag
Semaphore Wait Queue Pointer
1202
WaitingTaskCount

Figure 12

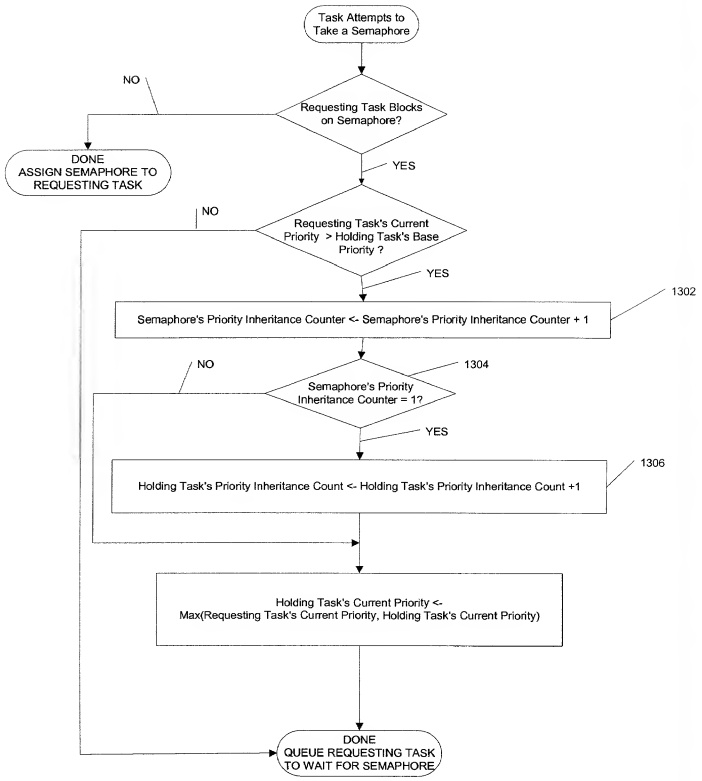
Task Attempts to Take a Semaphore
Requesting Task Blocks on Semaphore?
NO
YES
DONE
ASSIGN SEMAPHORE TO REQUESTING TASK
Requesting Task's Current Priority > Holding Task's Base Priority ?
NO
YES
1302
Semaphore's Priority Inheritance Counter <- Semaphore's Priority Inheritance Counter + 1
Semaphore's Priority Inheritance Counter = 1?
1304
NO
YES
1306
Holding Task's Priority Inheritance Count <- Holding Task's Priority Inheritance Count +1
Holding Task's Current Priority <-
Max(Requesting Task's Current Priority, Holding Task's Current Priority)
DONE
QUEUE REQUESTING TASK TO WAIT FOR SEMAPHORE

Figure 13

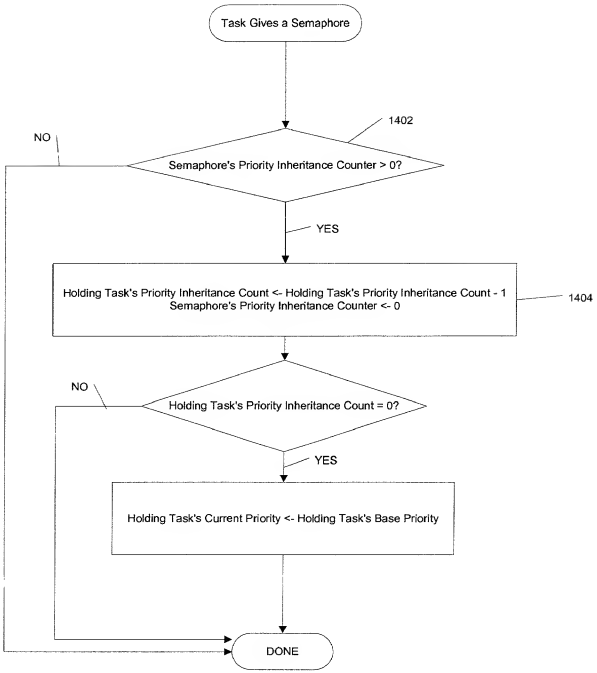
Task Gives a Semaphore
1402
NO
Semaphore's Priority Inheritance Counter > 0?
YES
Holding Task's Priority Inheritance Count <- Holding Task's Priority Inheritance Count - 1
Semaphore's Priority Inheritance Counter <- 0
1404
NO
Holding Task's Priority Inheritance Count = 0?
YES
Holding Task's Current Priority <- Holding Task's Base Priority
DONE

Figure 14

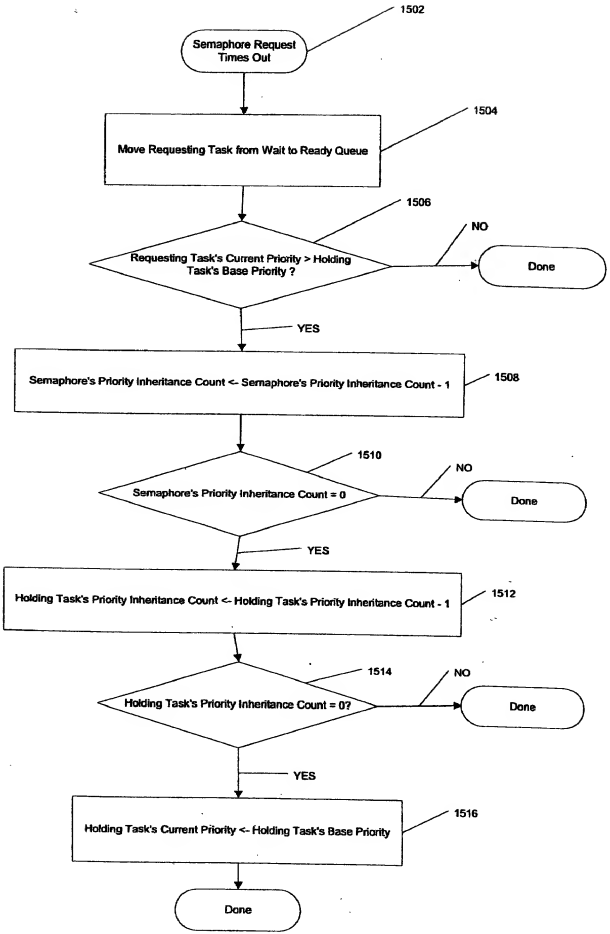
1502
Semaphore Request Times Out
1504
Move Requesting Task from Wait to Ready Queue
1506
Requesting Task's Current Priority > Holding Task's Base Priority ?
NO
Done
YES
Semaphore's Priority Inheritance Count <- Semaphore's Priority Inheritance Count - 1
1508
1510
Semaphore's Priority Inheritance Count = 0
NO
Done
YES
Holding Task's Priority Inheritance Count <- Holding Task's Priority Inheritance Count - 1
1512
1514
Holding Task's Priority Inheritance Count = 0?
NO
Done
YES
Holding Task's Current Priority <- Holding Task's Base Priority
1516
Done

FIGURE 15

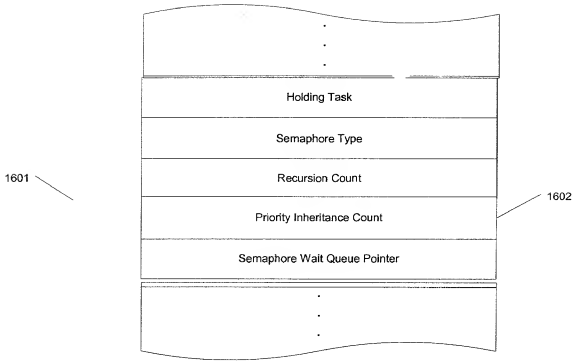
Holding Task
Semaphore Type
Recursion Count
Priority Inheritance Count
Semaphore Wait Queue Pointer
1601
1602

Figure 16